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Taxonomy and distribution of *Adenostegia*

ROXANA STINCHFIELD FERRIS

(WITH PLATES 10-12)

The genus *Adenostegia* was first described by Bentham* with the description of one species, *A. rigida*. Ten years later the same author published in De Candolle's *Prodromus*† four Nuttallian species, substituting Nuttall's manuscript name, *Cordylanthus*. This change was made on the ground that the meaning of the word *Cordylanthus* (*cordule*, club; *anthos*, flower) was more characteristic of the new species than was *Adenostegia* (*aden*, gland; *stegē*, covering). The proper generic name, according to present-day rules of nomenclature, was revived by Greene in 1891,‡ and later accepted by Kuntze§ and Wettstein.||

The affinities of *Adenostegia* are with *Castilleia* and *Orthocarpus*, and in Wettstein's generic arrangement of the Scrophulariaceae it is placed between them. The most noticeable likeness to *Castilleia* is shown in the section *Anisocheila* in the elongated upper lip of the corolla. A much more marked connection is found between the section *Chloropyron* and *Orthocarpus*, for here there are points of resemblance not only in the distinctly three-saccate flower but in the spike-like inflorescence as well.

The sections *Euadenostegia* and *Chloropyron* of *Adenostegia* exhibit the conspicuous degree of variability that is characteristic of many of the Scrophulariaceae. In *Euadenostegia* there are, besides the fixed species, two plastic groups, *rigida* and *pilosa*, in which the range of intraspecific variation creates difficulties in defining the species. The species of the *rigida* group are characterized by their hispid or hirsute pubescence and their tri-

* In Lindley, J. A natural system of botany. Ed. 2. 445. 1836.

† Prodr. Syst. Nat. 10: 597, 598. 1846.

‡ Some neglected priorities in generic nomenclature. Pittonia 2: 180-181. 1891.

§ Rev. Gen. Plant. 2: 456, 457. 1891.

|| In Engler & Prantl, Nat. Pflanzenfam. 4th: 98. 1891.

partite, callous bracts. The species of the *pilosa* group have a puberulent or pilose pubescence and their bracts are typically linear, though they are parted in *A. viscida* and *A. Hanseni*.

The genus is confined to western America and is characteristic of California and the Great Basin. Of the twenty-one species, there are but five that are not recorded from California and nine are known only from that state. According to the present records the range of the genus extends from Washington and southwestern Montana to Sonora, Chihuahua, and northern Lower California.

The members of the genus are found principally in open, exposed places in the Upper and Lower Sonoran and the Arid Transition Zones. Certain of the species may at times be met with in the Humid Transition Zone, but they occur only on exposed slopes that are truly "islands" of Upper Sonoran. All the species of the section *Chloropyron*, which is in part coastal, are found in salt marshes and on alkaline soils. This unusual habitat may account for the fact that this group appears not to conform to the ordinary zonal lines.

In preparing this paper I have had the opportunity of examining the material in the herbaria of the following institutions: the National Herbarium, the University of California and Stanford University.

I wish to express appreciation of the kindness shown me at the University of California during my work in that herbarium and to the National Herbarium for the loan of material. I also wish to thank Dr. L. R. Abrams for his advice and assistance and Dr. B. L. Robinson, of the Gray Herbarium, for fragments and photographs of types.

ADENOSTEGIA Benth.

Adenostegia Benth. in Lindley, Nat. Syst. ed. 2. 445. 1836.

Cordylanthus Nutt.; Bentham in De Candolle, Prodr. 10: 597. 1846.

Chloropyron Behr, Proc. Calif. Acad. 1: 61. 1855.

Rigid, summer-blooming annuals with divaricate or paniculate branches and yellow roots. Leaves alternate, entire, parted or dissected, those subtending the branches much longer than the others, deciduous with age; flowers in spikes, heads, or scattered along the branches; floral bracts entire, dissected, or parted;

calyx one- to two-leaved, lower leaf, when present, saccate at the base, upper leaf erect, winged at the base except in the section *Chloropyron*; corolla cylindrical, bilabiate, the lips nearly equal except in *A. laxiflora*; upper lip enclosing stamens and pistil, lower lip obscurely three-crenulate or entire, more or less saccate; stamens two or four, in unequal pairs, the anthers one- or two-celled, the lower cell, when perfect, subtending the upper, filaments generally hairy; capsule flattened, lanceolate or slightly rounded; seed irregular, more or less reticulate.

Key to sections

Lower lip of the corolla one-half the length of the upper lip.	I. ANISOCHEILA.
Lower lip of corolla equalling upper lip.	
Tube of the corolla one fifth the length of the throat.	II. PRINGLEA.
Tube of corolla more than one fifth the length of the throat.	
Calyx diphyllous.	III. EUADENOSTEGIA.
Calyx monophyllous.	
Calyx-leaf equalling corolla.	
Inflorescence capitate.	IV. KINGIA.
Inflorescence spicate.	VI. CHLOROPYRON.
Calyx leaf one half the length of the corolla.	V. DICRANOSTEGIA.

Section I. ANISOCHEILA

Cordylanthus § *Adenostegia* (in part) Gray, Proc. Am. Acad. 7: 381. 1868; Wats. Bot. King's Exped. 459.

Cordylanthus § *Anisocheila* Gray, Syn. Fl. 2¹: 303. 1886.

Adenostegia § *Anisocheila* Wettstein in Engler & Prantl, Nat. Pflanzenfam. 4^{3b}: 98. 1891.

Flowers scattered along the stems; calyx diphyllous, upper lip of corolla twice as long as lower; anthers one-celled or with vestige of second cell.

I. ADENOSTEGIA LAXIFLORA (Gray) Greene

Cordylanthus laxiflorus Gray, Bot. Mex. Bound. 2: 120. 1859; Gray, Proc. Am. Acad. 7: 383; Wats. Bot. King's Exped. 232, 460; Gray, Syn. Fl. 2¹: 303.

Adenostegia laxiflora Greene, Pittonia 2: 181. 1891; Kuntze, Rev. Gen. 2: 457; Wettstein in Engler & Prantl, Nat. Pflanzenfam. 4^{3b}: 98.

Paniculately branching annual, 3-4 dm. high, pubescent throughout with soft, glandular hairs; leaves 8-13 mm. long, one- to three-parted; flowers many, solitary or in groups of two to four; floral bract one half the length of calyx, deeply three-parted

into linear divisions rounded at the apex; upper calyx-leaf 11–16 mm. long, six- or seven-nerved, winged at the base, lanceolate or bidentate, pubescence sparse; lower calyx-leaf 10–15 mm. long, four-nerved, wider than the upper, rounded at the apex; corolla 16–18 mm. long, glabrous, the lower lip saccate; filaments glabrous; capsule 7–8 mm. long, slightly rounded; seeds reticulate. [PLATE 10, FIG. 1; PLATE 11, FIG. 1.]

TYPE LOCALITY: "Rocky hills, Sonora, Mexico, *Thurber*."

DISTRIBUTION: Hills and ravines in Arizona and northern Sonora.

SPECIMENS EXAMINED:—ARIZONA: "Point of Mountain," *Rothrock* 721; Pine Creek near Pine, *MacDougal* 693; hills, Beaver Creek, *Purpus* 8298.

Section II. PRINGLEA

Flowers in heads; calyx diphyllous; tube of corolla short and dilated; stamens four, perfect, the filaments villous.

2. ADENOSTEGIA PRINGLEI (Gray) Greene

Cordylanthus Pringlei Gray, Proc. Am. Acad. 19: 94. 1883;

Gray, Syn. Fl. 2¹: 453; Jepson, Fl. W. Mid. Calif. ed. 2. 387.

Adenostegia Pringlei Greene, Pittonia 2: 181. 1891; Kuntze,

Rev. Gen. 2: 457; Jepson, Erythea 7: 112; Jepson, Fl. W. Mid. Calif. 416.

Slender, glabrous annual, 4–6 dm. high; leaves 5–9 mm. long, linear-filiform, early deciduous, the lower sparsely pubescent, the upper glabrous; heads many, compact, three- to five-flowered; floral bracts 5–7 mm. long, glabrous, with five to seven equal lobes; calyx-leaves 9–11 mm. long, nearly equal, upper part covered with large, tack-like glands; corolla 8–9 mm. long, lips densely hairy; capsule rounded. [PLATE 10, FIG. 2; PLATE 11, FIG. 2.]

TYPE LOCALITY: "California, on dry hills in Lake Co., August, 1882, Pringle."

DISTRIBUTION: Exposed slopes in the mountains of Lake and Napa Counties, California; Upper Sonoran Zone.

SPECIMENS EXAMINED:—CALIFORNIA: Lake County, August, 1882, *Pringle*; Snow Mountain, Lake County, August 25, 1892, *Katharine Brandegee*; Cobb Mountain, Lake County, 1910, *Katharine Brandegee*; near Bartlett Springs, Lake County, August, 1916, *A. Stinchfield*.

Section III. EUADENOSTEGIA

Cordylanthus § *Adenostegia* (in part) Gray, Proc. Am. Acad. 7: 381. 1868; Wats. Bot. King's Exped. 459; Gray, Bot. Calif. 1: 580; Gray, Syn. Fl. 2¹: 303.

Adenostegia § *Euadenostegia* Wettstein in Engler & Prantl, Nat. Pflanzenfam. 4^{3b}: 98. 1891.

Flowers scattered along the branches or in heads; calyx diphyllous; corolla lips equal; anthers one- or two-celled, filaments villous.

Key to species of § Euadenostegia

- | | |
|--|--|
| Stamens two..... | 3. <i>A. capitata</i> . |
| Stamens four. | |
| Anthers one-celled..... | 9. <i>A. Nevinii</i> . |
| Anthers two-celled. | |
| Bracts entire or with the callous tips notched. | |
| Herbage densely cinereous pilose..... | 4. <i>A. pilosa</i> . |
| Herbage puberulent with few pilose hairs... | 5. <i>A. tenuis</i> . |
| Bracts distinctly parted. | |
| Bracts three-parted. | |
| Flowers scattered along the branches;
herbage pilose. | |
| Tips of bracts enlarged or calloused. | |
| Flowers 14 mm. or less long; middle
lobe of bract exceeding lateral
lobes..... | 6. <i>A. viscida</i> . |
| Flowers 16 mm. or more long;
lobes of bracts nearly equal.... | 7. <i>A. Hanseni</i> . |
| Tips of bracts not enlarged or cal-
loused..... | 8. <i>A. parviflora</i> . |
| Flowers in heads; herbage hispid or hir-
sute. | |
| Bracts parted nearly to base; pubes-
cence long hirsute..... | 10. <i>A. filifolia</i> . |
| Bracts parted only to middle. | |
| Lower calyx-leaf about 1 mm.
longer than the upper. | |
| Pubescence sparsely hispid ... | 11. <i>A. rigida</i> . |
| Pubescence copious hirsute ... | 11a. <i>A. rigida brevibracteata</i> . |
| Lower calyx-leaf at least 2 mm.
longer than the upper..... | 12. <i>A. littoralis</i> . |
| Bracts five- to seven-parted. | |
| Corolla 15-17 mm. long..... | 13. <i>A. ramosa</i> . |
| Corolla 22-30 mm. long..... | 14. <i>A. Wrightii</i> . |

3. ADENOSTEGIA CAPITATA (Nutt.) Greene

Cordylanthus capitatus Nutt.; Benth. in De Candolle, Prodr. 10: 597. 1846; Gray, Proc. Am. Acad. 7: 382; Wats. Bot. King's Exped. 231, 459; Gray, Bot. Calif. 1: 580; Gray, Syn. Fl. 2¹: 304.

Adenostegia capitata Greene, Pittonia 2: 180. 1891; Kuntze, Rev. Gen. 2: 457; Howell, Fl. N. W. Am. 537; Piper, Contr. U. S. Nat. Herb. 11: 518; Rydberg, Bull. Torrey Club 40: 484. 1913.

Adenostegia ciliosa Rydb. Bull. Torrey Club 34: 35. 1907.

Cordylanthus bicolor A. Nels. Bot. Gaz. 54: 416. 1912.

Paniculately branching annual, 4–6 dm. high, short-pilose throughout with glandular hairs; leaves many, 2–5 cm. long, linear or three-parted; heads two- to five-flowered; flowers spreading, giving an open appearance to the head; floral bracts 8–10 mm. long, three-parted, the divisions linear-lanceolate, spreading, the middle division twice as long as the lateral divisions; calyx-leaves purplish, the upper 8–9 mm. long, thin, two-nerved, two-toothed, the teeth 2–3 mm. long, the lower 10–13 mm. long, five-nerved, broad at the apex and curved outward; corolla 10–12 mm. long, covered with reflexed hairs, the tube longer than the throat, purple, tipped with yellow; stamens two, the anthers one-celled with vestiges of a second cell, the filaments nearly glabrous, with a U-shaped curve near the anther; capsule 5–6 mm. long, slender, pointed; seeds few, reticulate. [PLATE 10, FIG. 3.]

Co-types of *Cordylanthus bicolor* examined by the author are not distinct from *A. capitata*. Specimens of *A. ciliosa* have not been examined, but Rydberg (Bull. Torrey Club 40: 484. 1913) states that his species is identical with Nelson's.

TYPE LOCALITY: "In Novâ Californiâ (Nuttall!)."

DISTRIBUTION: Mountain ranges of Washington and Idaho to Lassen County, California; Arid Transition Zone.

SPECIMENS EXAMINED:—WASHINGTON: Yakima Region, 1882, Brandegee; Falcon Valley, Suksdorff 201. IDAHO: Redfish Lake, Evermann 408; Blaine County, Nelson & MacBride 1239; Pinehurst, Boise County, Macbride 1671. OREGON: Powder River, Cusick 1784; same locality, Piper 2482; Hepburn Ridge, Wallowa County, Sheldon 8643; same locality, Howell. CALIFORNIA: hills near Lassen Creek, Mrs. Austin 146. NEVADA: Coleman Valley, Coville & Leiberg 95; Clover Mountains, Watson 816; Gold Creek, Elko County, Kennedy 4282.

4. ADENOSTEGIA PILOSA (Gray) Greene

Cordylanthus pilosus Gray, Proc. Am. Acad. 7: 382. 1868; Wats. Bot. King's Exped. 459; Gray, Bot. Calif. 1: 581; Gray, Syn. Fl. 2¹: 304; Jepson, Fl. W. Mid. Calif. ed. 2. 387.

Adenostegia pilosa Greene, Pittonia 2: 180. 1891; Kuntze, Rev. Gen. 2: 456; Jepson, Fl. W. Mid. Calif. 416.

Stout, paniculately branching annual, 6–12 dm. high; stems somewhat reddish, glandular with rather short, pilose hairs; leaves 10–20 mm. long, truncate and often callous-emarginate at apex; flowers scattered along the branches; floral bracts linear, 15–25 mm. long, cinereous-pilose, the callous tip dilated, sometimes three-notched, three-nerved; upper calyx-leaf 20–22 mm. long, shallowly bidentate, three-nerved, pubescence sparse, the lower calyx-leaf 19–21 mm. long, broadly lanceolate, with pubescence as on the bracts; corolla 15–18 mm. long, the tube shorter than the throat, greenish white with reddish-purple markings at base of throat and on lower lip; stamens four, perfect, the filaments villous; capsule not sharply pointed; seeds few, slightly reticulate. [PLATE 10, FIG. 4.]

TYPE LOCALITY: "Dry soil near San Jose."

DISTRIBUTION: Interior valleys and foothills of California, from Trinity and Mendocino Counties southward to Santa Clara County; Upper Sonoran Zone. The specimens from the higher elevations in Lake and Mendocino Counties are less pilose but do not differ structurally from the typical form.

SPECIMENS EXAMINED:—CALIFORNIA: Eureka—Red Bluff Road, Trinity County, *Abrams* 6158; between Harris and Alder Point, Trinity County, *Abrams* 5964; near summit of Mt. Sanhedrin, Lake County, *Heller* 5997; Cobb Mountain, Lake County, August 13, 1910, *Katharine Brandegee*, near Bartlett Springs, Lake County, August, 1911, *A. Stinchfield*; Princeton, Colusa County, October, 1905, *Chandler*; St. Helena Sanitarium, Napa County, *Abrams* 5752; foothills, Yolo County, *Stinchfield* 345; Petrified Forest, Sonoma County, *Bioletti & Michener* 1731a; Weldon Cañon, Vaca Mountains, Salona County, September 13, 1891, *Jepson*; near San Jose, Santa Clara County, *Brewer*; foothills west of Los Gatos, Santa Clara County, *Heller* 7532; same locality, *Eastwood*; Palo Alto, *Baker* 1714; Stevens Creek Road, Santa Clara County, *Stinchfield* 247; near Stanford University, *Stinchfield* 255; Raymond Ranch, Santa Cruz Mountains, August 14, 1911, *Blasdale*;

near Saratoga, *Pendleton* 270; near Colley's Landing, Palo Alto, September 29, 1906, *Abrams*.

5. ADENOSTEGIA TENUIS (Gray) Greene

Cordylanthus tenuis Gray, Proc. Am. Acad. 7: 383. 1868; Wats.

Bot. King's Exped. 232, 460; Gray, Bot. Calif. 1: 581; Gray, Syn. Fl. 2¹: 304; Hall, Yosemite Flora 229.

Cordylanthus pilosus var. *Bolanderi* Gray, Proc. Am. Acad. 7: 382.

1868; Gray, Bot. Calif. 1: 581; Gray, Syn. Fl. 2¹: 304.

Adenostegia tenuis Greene, Pittonia 2: 180. 1891; Kuntze, Rev.

Gen. 2: 456; Wettstein in Engler & Prantl, Nat. Pflanzenfam. 4^{3b}: 98.

Adenostegia pilosa var. *Bolanderi* Greene, Pittonia 2: 180. 1891.

Adenostegia Bolanderi Kuntze, Rev. Gen. 2: 456. 1891.

Slender, paniculately branching annual, 2–6 dm. high; stems puberulent with short, scattered, glandular, pilose hairs, sometimes glabrous; leaves 1–3 cm. long linear, occasionally with callous tips; flowers scattered along the branches; floral bracts 12–20 mm. long, puberulent, ciliate with glandular, pilose hairs, linear-lanceolate, entirely herbaceous or with callous tips; calyx-leaves with pubescence as on bracts, the upper 15–18 mm. long, three-nerved, lanceolate, sometimes bidentate, the lower 14–18 mm. long, five-nerved, broadly lanceolate; corolla 12–15 mm. long, the tube about equalling the throat, inconspicuously hairy; capsule 8 mm. long; seeds few, somewhat reticulated. [PLATE 10, FIG. 5.]

The glabrous or puberulent type of *A. tenuis* is found in the Lake Tahoe region and in western Nevada, while the form described as *A. pilosa* var. *Bolanderi* is characteristic of the mountain ranges north of this region. This last-named form was described by Gray as being more nearly related to *A. pilosa*, but an examination of co-type material shows that the bracts are not notched as they are in *A. pilosa* and that in the pubescence it is like *A. tenuis* except for the presence of scattered, pilose hairs.

The specimens from Lake County are like the Nevada form, while those from the Kings River region more closely resemble *A. pilosa*.

TYPE LOCALITY: "Dry sandy soil near Lake Tahoe, Nevada, Brewer, Dr. C. L. Anderson."

DISTRIBUTION: Exposed slopes in Lake County in the Coast

Range and in the Sierra Nevada Mountains from Lassen County to Fresno County, California, and in western Nevada; Transition and Canadian Zones.

SPECIMENS EXAMINED:—CALIFORNIA: Mt. Hannah, Lake County, *Tracy* 3247; Susanville Summit, Lassen County, July 2, 1897, *Jones*; Grizzly Hill, Plumas County, *Leiberg* 5207; Clio, Plumas County, *Eggleston* 6240; Sierra Valley Hot Springs, Sierra County, August, 1909, *Dudley*; Soda Springs, Nevada County, *Jones* 2589; Susie Lake Trail, Eldorado County, *McGregor* 125; Lake Tahoe, Eldorado County, *Leiberg* 5327; Agricultural Station, Amador County, *Hansen* 697; between Big Trees and Gardner's, Calaveras County, August, 1906, *Dudley*; near Mariposa Big Trees, Mariposa County, *Abrams* 5397; same locality, August 11, 1895, *Congdon*; Mariposa Big Tree Grove, *Bolander* 4993 (co-type of *A. pilosa* var. *Bolanderi*); Yosemite National Park, Glacier Point, *Hall* 9202; Tamarack Flat, *Abrams* 5474; near foot of Yosemite Falls, *Abrams* 5466; trail between Illillouette and Glacier Point, *Abrams* 5430; Converse Basin, Fresno County, October, 1900, *Dudley*; Kings River Region, Fresno County, August, 1904, *Dudley*; west of Bearskin Meadow, August, 1904, *Dudley*; same locality, *Hall & Chandler* 179. NEVADA: near Lake Tahoe, *Brewer* 2150; Clear Lake Cañon, Ormsby County, *Baker* 1408; mountains west of Bowers, Washoe County, *Heller* 10663; Galena Creek, Washoe County, *Heller* 10671; Lake Tahoe, Washoe County, *Kennedy* 1458.

6. ADENOSTEGIA VISCIDA Howell

Adenostegia viscida Howell, Fl. N. W. Am. 537. 1903.

Paniculately branching annual, 2–4 dm. high; short pilose throughout with viscid-glandular hairs; leaves 18–25 mm. long, linear-lanceolate, occasionally three-parted; flowers scattered along the branches, solitary or in groups of three or four; bracts 10–14 mm. long, slender, three-parted, enlarged and slightly calloused at the apex; calyx-leaves 15–16 mm. long, the upper the longer, four-nerved, the lower five-nerved; corolla 12–14 mm. long; stamens four, perfect, the filaments villous; capsule 6–7 mm. long. [PLATE 10, FIG. 6.]

A. viscida in Shasta and Plumas Counties is inconspicuously glandular-pilose as compared with the typical form and approaches *A. tenuis*, to which this species is very closely related.

TYPE LOCALITY: "On dry slopes, eastern base of the Coast Mountains, near Waldo, Southern Oregon."

DISTRIBUTION: Siskiyou Mountains, Oregon, south to Plumas County, California.

SPECIMENS EXAMINED:—OREGON: Illinois River in the Siskiyou Mountains, *Cusick* 2937; same locality, July, 1887, *Howell*; near Fort Klamath, *Leiberg* 636; Klamath County, *Mrs. Austin & Bruce* 1773; Rogue River, *Brackenridge* 1192; Upper Metolins River, Crook County, *Coville & Applegate* 700; Wimer, Jackson County, *Hammond* 318. CALIFORNIA: Mt. Eddy, Siskiyou County, *Heller* 11744; Weed, *Heller* 11723; Burney Falls, Shasta County, August, 1899, *Dudley*; Bear Valley Mountains, Shasta County, June and August, 1893, *Baker*; Big Meadows, Plumas County, *Mrs. Bruce* 411; Lassen Buttes, Plumas County, *Brown* 637; Grizzly Hill, Plumas County, *Leiberg* 5107.

7. *Adenostegia Hansenii* sp. nov.

Stout, paniculately branching annual, 5–12 dm. high; stem reddish, glandular throughout with long, cinereous, pilose hairs which are often 4–5 mm. long; leaves 12–30 mm. long, truncate and often calloused at the apex; flowers scattered along the branches; floral bracts 15–30 mm. long, 3-nerved, 3-parted, the divisions 4–7 mm. long, nearly equal, enlarged and callous-emarginate at apex; calyx leaves 15–22 mm. long, the upper lanceolate, the lower rounded; corolla 16–18 mm. long, the tube nearly equalling the throat; stamens 4, perfect, the filaments villous; capsule 7–8 mm. long. [PLATE 10, FIG. 7; PLATE 11, FIG. 3.]

This species closely resembles *A. pilosa* in habit, but is readily distinguishable by the tripartite bract and the long, pilose hairs.

TYPE LOCALITY: Agricultural Station, Amador County, California; alt. 2,000 ft., September, 1893, *Hansen* 138. TYPE, No. 21142 of the Dudley Herbarium.

DISTRIBUTION: Foothills of the Sierra Nevada from Shasta County to Tuolumne County, California; Upper Sonoran Zone.

SPECIMENS EXAMINED:—CALIFORNIA: north of Redding, Shasta County, *Heller* 12501; between Bellavista and Ingot, Shasta County, July, 1914, *McMurphy*; four miles east of Placerville, Tehama County, *Heller* 12551; east of Oroville, Butte County, *Heller* 11569; Agricultural Station, Amador County, alt. 2,000 ft.,

Hansen 138; near Ione, Amador County, *Braunton 121*; Wards Ferry, alt. 1,500 ft., Tuolumne County, *Abrams 4717*; French Flat, near Rawhide, Tuolumne County, *Stinchfield 64*; plains of the Sacramento, *Pickering 1348*.

8. *Adenostegia parviflora* sp. nov.

Divaricately branching annual, 3 dm. high, puberulent and minutely viscid-pilose throughout; leaves 10–15 mm. long; flowers many, scattered along the branches; floral bracts 5–6 mm. long, three-parted into linear divisions with rounded, herbaceous tips; calyx leaves 11–13 mm. long, the lower slightly exceeding the upper; corolla 10–11 mm. long, tube nearly equalling throat; stamens 4, perfect, the filaments villous; capsule lanceolate. [PLATE 10, FIG. 8; PLATE 11, FIG. 4.]

TYPE LOCALITY: Grand Canyon of the Colorado River, near the San Francisco Mountains, Arizona, *Knowlton 270*. TYPE, No. 48859 of the U. S. National Herbarium.

9. ADENOSTEGIA NEVINII (Gray) Greene

Cordylanthus Nevinii Gray, Proc. Am. Acad. 17: 229. 1882; Gray, Syn. Fl. 2¹: 454.

Adenostegia Nevinii Greene, Pittonia 2: 181. 1891; Kuntze, Rev. Gen. 2: 457; Hall, Univ. Calif. Pub. Bot. 1: 114.

Slender, paniculately branching annual, 3–4 dm. high; hirsute when young, puberulent in age; lower leaves dense, 20–25 mm. long, three-parted into linear divisions, the upper leaves scarcely 10 mm. long, linear, rarely parted, covered with a short, cinereous pubescence; flowers in axillary clusters of two to four; floral bracts scarcely one half the length of the calyx, short pubescent, three-parted into linear divisions with emarginate, glandular tips; calyx leaves hispidulous throughout and with soft ciliate edges, the upper 12–13 mm. long, 6-nerved, winged at the base, the lower equalling the upper, 5–6-nerved, broadly lanceolate; corolla 11–12 mm. long, glandular, the tube less than one half the length of the throat; stamens 4, the anthers 1-celled, the filaments villous; capsule not sharply pointed. [PLATE 10, FIG. 9.]

TYPE LOCALITY: "California, in the San Bernardino Mountains, at about 5000 feet, *Rev. J. C. Nevin*, 1880; *S. B. & W. F. Parish*, 1881."

DISTRIBUTION: Mountain ranges of Southern California, from

Mt. Pinos to the Cuyamaca Mountains, San Diego County; Arid Transition Zone.

SPECIMENS EXAMINED:—CALIFORNIA: Upper San Antonio Cañon, Los Angeles County, *Johnston* 1662; Swartout Cañon, San Gabriel Mountains, San Bernardino County, September, 1904, *G. R. Hall*; Bear Valley, San Bernardino County, *Abrams* 2079; same locality, *Davidson*, 1894; same locality, June 29, 1897, *Chandler*; San Bernardino Mountains, *Parish Brothers* 992; San Jacinto Mountains, Riverside County, *Hall* 2619; Lockwood Valley, Ventura County, *Hall* 6644; Cuyamaca, San Diego County, 1884, *Orcutt*; same locality, October 15, 1894, *Brandege*.

10. ADENOSTEGIA FILIFOLIA (Nutt.) Abrams

Cordylanthus filifolius Nutt.; Bentham in De Candolle, Prodr. 10:

597. 1846; Wats. Bot. King's Exped. 459 (in part); Gray,

Bot. Calif. 1: 581 (in part); Gray, Syn. Fl. 2¹: 303 (in part).

Adenostegia rigida Greene, Pittonia 2: 180 (in part). 1891; Hall,

Univ. Calif. Pub. Bot. 1: 114.

Adenostegia filifolia Abrams, Fl. Los Angeles 372. 1904.

Cordylanthus rigidus var. *filifolius* McBride, Contrib. Gray Herb.

N. S. 49: 58. 1917.

Slender, paniculately branching annual, 3–5 dm. high, the stems hirsute, the lower part puberulent; leaves linear or three-parted, puberulent with scattered, hirsute hairs; mature floral heads compact, flat topped, five- to eight-flowered; floral bracts 12–16 mm. long, deeply three-parted into linear divisions of one fourth the length of the bract, densely covered with long, spreading, hirsute hairs, tips of the divisions enlarged, calloused, emarginate, with a large gland in the emargination; calyx-leaves 13–16 mm. long, short-hirsute, the upper 4–5-nerved, rounded at apex; corolla 12–15 mm. long, the tube shorter than the throat; stamens four, the anthers two-celled; capsule not sharply pointed; seeds slightly reticulate. [PLATE 10, FIG. 10.]

TYPE LOCALITY: "Ad San Diego (Nuttall!)."

DISTRIBUTION: Dry ridges and open places from Ventura County in California to the northern part of Lower California; Upper and Lower Sonoran Zones.

SPECIMENS EXAMINED:—CALIFORNIA: San Felipe, Los Angeles County, *Hayes* 582; Glendora, Los Angeles County, 1892, *Miss Palmer*; Ramona, Los Angeles County, July, 1903, *Brandege*;

Hobart, Los Angeles County, *Braunton* 513; Newhall, October 14, 1882, *Pringle*; Victorville, San Bernardino County, *Parish* 10523; Lytle Creek Cañon, San Bernardino County, *Abrams* 2745; same locality, *Hall* 1423; San Jacinto Mountains, Riverside County, *Hall* 2621; San Diego, San Diego County, August, 1916, *McMurphy*; same locality, September, 1903, *Brandeggee*; same locality, August, 1906, *Katharine Brandeggee*; same locality, July, 1895, *Stokes*; Point Loma, San Diego County, *Hall* 8325; Viejas Grade to Descanso, San Diego County, July, 1906, *Katharine Brandeggee*; between La Mesa and Jamul, San Diego County, *Abrams* 5006; Del Mar, San Diego County, August 5, 1906, *Katharine Brandeggee*; Witch Creek, San Diego County, *Anderson* 248; Tecate River, San Diego County, *Shoenfeldt* 3741; same locality, *Mearns* 3797; Laguna Mountains, Imperial County, *McGregor* 97; Southwestern Colorado Desert, Imperial County, June, 1889, *Orcutt*.

II. ADENOSTEGIA RIGIDA Benth.

Adenostegia rigida Benth. in Lindley, Nat. Syst. ed. 2. 445. 1836; Bentham in De Candolle, Prodr. 10: 537; Greene, Pittonia 2: 180 (in part); Wettstein in Engler & Prantl, Nat. Pflanzenfam. 4^{3b}: 98; Jepson, Fl. W. Mid. Calif. 416.

Cordylanthus filifolius Gray, Bot. Mex. Bound. 2: 120. 1859; Gray, Proc. Am. Acad. 7: 382. Not Nuttall.

Cordylanthus rigidus Jepson, Fl. W. Mid. Calif. ed. 2. 387. 1911.

Diffusely branching annual, 3–6 dm. high; stems often reddish, puberulent with scattered, hirsute hairs, glabrous with age; leaves 12–15 mm. long, linear-filiform, occasionally three-parted, canescent-puberulent; mature heads compact, six- to twelve- rarely fifteen-flowered; floral bracts 12–20 mm. long, sparsely hispid, the ciliate margins interspersed with soft hairs, three-parted into linear divisions, the apex calloused, enlarged and truncate or slightly emarginate, the veins prominent; calyx-leaves 18–21 mm. long, sparsely hispid, five-nerved, the lower broad, 1 mm. longer than the upper; corolla 16–19 mm. long, the tube equalling or slightly shorter than the throat; stamens four, the anthers two-celled; capsule not sharply pointed; seeds slightly reticulate. [PLATE 10, FIG. 11.]

TYPE LOCALITY: "Herba Novo-californica." The exact type locality of this species is doubtful, but of various specimens sent to the Kew Herbarium by Dr. Abrams in 1903, one from Naci-

miento River, Monterey County, was said to agree most closely with Douglas's specimen. It is known that Douglas visited San Antonio Mission and collected in the Santa Lucia Mountains. So we may safely assume that the type locality of this species is in that region.

DISTRIBUTION: Exposed slopes in the inner Coast Ranges of California from the Santa Cruz Mountains to the Santa Lucia Mountains; Upper Sonoran Zone.

SPECIMENS EXAMINED:—CALIFORNIA: Crystal Springs, Santa Cruz Peninsula, 1896, *Eastwood*; Permanente Creek, July, 1903, *Dudley*; Castle Rock Ridge, October, 1906, *Abrams*; near Congress Springs, *Stinchfield* 248; near Saratoga, *Pendleton* 234; near Wrights, *Dudley*, 1894; California Redwood Park, *Stinchfield* 253; same locality, *Abrams* 6384; Glenwood Station, August, 1900, *Davis*; head of Aptos Creek, *Abrams* 3028; Santa Lucia Mountains, *Condit* 8; same locality, *Vasey* 483; same locality, May-July, 1892, *Vortriede*; Jolon, July 30, *Brandege*; Tassajara Hot Springs, July 18, 1908, *Cox*.

IIa. ADENOSTEGIA RIGIDA BREVIBRACTEATA (Gray) Greene

Cordylanthus filifolius var. *brevibracteatus* Gray, Bot. Calif. 1: 622. 1876; Gray, Syn. Fl. 2¹: 304.

Adenostegia rigida var. *brevibracteata* Greene, Pittonia 2: 180. 1891; Coville, Contr. U. S. Nat. Herb. 4: 173.

Habit as in typical *A. rigida*; bracts with distinctly calloused, emarginate tips, often dark colored, with prominent veins; bracts and calyx-leaves copiously hirsute-ciliate. [PLATE 10, FIG. 12.]

The short bracts upon which Gray based the name are characteristic of the specimens from Fresno and Kern Counties. These specimens, however, have the hirsute-ciliate pubescence of all the Sierran forms. A form growing at Santa Barbara and near Visalia, Tulare County, has less conspicuously calloused bracts, but seems to grade into typical *brevibracteata*.

I have examined the following three collections from the Kaweah region: meadows near Monarch Lake, *Dudley* 1230; Bearskin Meadow, King's River region, August, 1904, *Dudley*; Grant Forest Reservation, August, 1910, *Katharine Brandege*. These undoubtedly belong to the *A. rigida* group but cannot be

correctly identified because of insufficient material. The form represented in these collections differs from *A. rigida brevibracteata* in being glabrous throughout, except for the slightly ciliated bracts, and in the shape and herbaceous character of the bracts.

TYPE LOCALITY: "Near Soda Spring on Kern River, at 8,500 feet, *Rothrock*, in Wheeler's Exped., 1875."

DISTRIBUTION: Mariposa County to Tulare County, California, and also on the eastern side of the Mt. Hamilton Range; Upper Sonoran Zone. This variety is characteristic of the Digger Pine Belt and ranges from Mariposa County along the foothills of the Sierra Nevada to Tehachapi Pass, while a slightly different form occurs in Santa Barbara and Tulare Counties.

SPECIMENS EXAMINED:—CALIFORNIA: Western slope of Pecheco Pass, Santa Clara County, *Abrams* 5285; Mormon Bar, Mariposa County, 1883, *Congdon*; Wawona, Mariposa County, October, 1895, *Ward*; Yosemite National Park, *Bolander* 5012; Marble Fork of Kaweah River, Tulare County, August, 1905, *Katharine Brandege*; Soda Springs of Kern River, Tulare County, *Hall & Babcock* 5572; Visalia, Tulare County, October, 1881, *Congdon*; North Fork of Kern River, Kern County, *Coville & Funston* 1602; Poso Creek, Kern County, August, 1853, *Heerman*; Tehachapi, Kern County, August, 1894, *Eastwood*; Santa Barbara, Santa Barbara County, *Elmer* 3741; La Cumbre Trail, Santa Inez Mountains, Santa Barbara County, *Abrams* 4302; road to Monteci, Santa Barbara County, *Eastwood* 199; Mountain Drive, Santa Barbara, *Abrams* 4113.

12. *Adenostegia littoralis* sp. nov.

Diffusely branching annual, 3–6 dm. high; stems puberulent, without hirsute hairs; leaves 13–15 mm. long, entire; flower-heads compact, five- to ten-flowered; floral bracts 14–22 mm. long, three-parted, the divisions slender, pubescence soft-puberulent with an occasional hispidulous hair, tips truncate or with a tack-like enlargement of the veins, not distinctly calloused; lower calyx-leaf at least 2 mm. longer than the upper, pubescence as on the bracts; corolla 16–19 mm. long, the tube equalling or slightly shorter than the throat; stamens four, the anthers two-celled. [PLATE 10, FIG. 13; PLATE 12, FIG. 1.]

This species was recognized as a form distinct from *A. rigida* by Heller (*Muhlenbergia* 2: 251), but no name was applied to it.

It differs most noticeably from *A. rigida* in the divisions of the bracts, which are narrow instead of broad, in the pubescence and in the long lower calyx-leaf.

TYPE LOCALITY: Carmel, Monterey County, California, open pine woods, August 17, 1909, *Abrams 4254*. TYPE, No. 21173 of the Dudley Herbarium.

DISTRIBUTION: Sand dunes and open woods of the Monterey Peninsula, California; Transition Zone.

SPECIMENS EXAMINED:— CALIFORNIA: Carmel, Monterey County, *Abrams 4254*; near Del Monte, Monterey County, *Heller 8247*; Del Monte, *Elmer 4080*.

13. *ADENOSTEGIA RAMOSA* (Nutt.) Greene

Cordylanthus ramosus Nutt.; Bentham in De Candolle, Prodr. 10: 597. 1846; Wats. Bot. King's Exped. 232, 459; Gray, Bot. Calif. 1: 580; Gray, Syn. Fl. 2¹: 303; Coulter & Nelson, Man. Bot. Rocky Mts. 462.

Adenostegia ramosa Greene, Pittonia 2: 180. 1891; Kuntze, Rev. Gen. 2: 456; Howell, Fl. N. W. Am. 1: 537.

Paniculately much branched annual, 2–3 dm. high, cinereous puberulent throughout; leaves 15–20 mm. long, linear-filiform, one- to three-parted, flowers sometimes solitary, mostly in three- to five-flowered heads; floral bracts often scantily hirsute-ciliate, parted into five to seven linear divisions; upper calyx-leaf 18–22 mm. long, broadly lanceolate or inconspicuously bidentate, five-nerved, lower calyx-leaf 17–20 mm. long, lanceolate or two-lobed, pubescence like that of bract; corolla 15–17 mm. long, the tube longer than the throat; stamens four, the anthers perfect, the filaments villous; capsule 10–11 mm. long, slender; seeds many, small, reticulate. [PLATE 10, FIG. 14.]

TYPE LOCALITY: "In mont. Scopulosis (Nuttall! Tolmie!)."

DISTRIBUTION: Southwestern Montana to southwestern Colorado and westward to Oregon and Lassen County, California; Arid Transition Zone.

SPECIMENS EXAMINED:— OREGON: Grizzly Butte, Crook County, *Leiberg 848*; Lake County, *Mrs. Austin 1772*; Warner Range, Lake County, *Coville & Leiberg 55*; White Horse Mountains, Lake County, *Griffiths & Morris 449*; eastern Oregon, *Cusick 1750, 1197*. CALIFORNIA: Plumas Junction, Lassen

County, *Eggleston* 6205; Goose Lake Valley, Lassen County, *Mrs. Austin* 245. NEVADA: Kings Cañon, Ormsby County, *Baker* 1499; Quinn River Crossing, Humboldt County, *Griffiths & Morris* 139; Tuscarora, Elko County, *Heller* 9182; same locality, *Kennedy* 606; Blaine, Elko County, *Heller* 11115; Humboldt Wells, Elko County, *Heller* 9182; hills around Austin, Lander County, *Kennedy* 4038; Toyabe Range, Lander County, *Kennedy* 4093; Wells, Lander County, August, 1882, *Jones*. IDAHO: Pocatello, Snake Plains, *Palmer* 408; near big Camas Prairie, *Henderson* 3160; Dry Creek, Snake Plains, *Palmer* 336; Houston, *Henderson* 3799; Flint Creek, Owyhee County, *MacBride* 496; Blackfoot, Snake Plains, *Palmer* 292; Minidoka, Lincoln County, *Nelson & MacBride* 1313. UTAH: Parley's Park, Summit County, *Smith* 1887; Echo Cañon, *Watson* 817. MONTANA: Grasshopper Valley, southwest Montana, *Watson* 323. WYOMING: Fossil Station, August 10, 1885, *Letterman*; Dubois, *Nelson* 711; Evanston, July 10, 1897, *Williams*; river bottoms, Carbon County, *Tweedy* 3409; Cokeville, *Cary* 704; Crook Creek, Fremont County, *Goodding* 528; Fort Bridger, July 29, 1873, *Porter*; Slater, Colorado-Wyoming line, Carbon County, *Goodding* 1727. COLORADO: Mancos, July, 1890, *Miss Eastwood*.

14. ADENOSTEGIA WRIGHTII (Gray) Greene

Cordylanthus Wrightii Gray, Bot. Mex. Bound. 2: 120. 1859; Gray, Proc. Am. Acad. 7: 382; Wats. Bot. King's Exped. 459; Gray, Syn. Fl. 2¹: 453; Coulter, Contr. U. S. Nat. Herb. 2: 316; Coulter & Nelson, Man. Bot. Rocky Mts. 462. *Adenostegia Wrightii* Greene, Pittonia 2: 180. 1891; Kuntze, Rev. Gen. 2: 457; Wooton & Standley, Contr. U. S. Nat. Herb. 19: 590.

Paniculately branching annual, 3–5 dm. high; inconspicuously puberulent or in age glabrous; leaves linear-filiform, often dissected; heads five- to ten-flowered, spreading; floral bracts 18–20 mm. long, glabrous, deeply divided into dissected, filiform divisions; upper calyx-leaf 23–28 mm. long, five-nerved, shallowly bidentate, lower calyx-leaf 24–30 mm. long, three- to four-nerved, tip lanceolate or two- to four-toothed, the teeth 1–4 mm. long; corolla 22–30 mm. long, the tube longer than the throat; stamens four, the anthers two-celled, the filaments villous; capsule 11–12 mm. long; seeds reticulate. [PLATE 10, FIG. 15.]

A form with scattered flowers, corresponding to an herbarium specimen named by Gray for Dr. Matthews, occurs within the range of *A. Wrightii*. As it appears to differ from *A. Wrightii* only in having the flowers in smaller clusters it is not here considered distinct.

TYPE LOCALITY: "Prairies from 6-30 miles east of El Paso, western Texas; Wright (450). Sand Hills, Chihuahua; Thurber."

DISTRIBUTION: Utah and southern Colorado to Arizona and south to Chihuahua, Mexico.

SPECIMENS EXAMINED:—UTAH: Willow Creek, southeastern Utah, *Miss Eastwood* 98; La Salle Mountains, *Purpus* 7020. COLORADO: Mesa Verde, southwestern Colorado, August, 1892, *Miss Eastwood*. ARIZONA: Chiricahua Mountains, *Blumer* 1744; White Mountains, *Griffiths* 5379; Oracle, August 28, 1903, *Jones*; Black River, *Rothrock* 795; Strawberry Valley, *Toumey* 360; Keans Cañon, 1897, *Hough*; Navajo to Hawthorne, *Griffiths* 5801; San Francisco Mountains, *Knowlton* 210; Cosmino, *Jones* 4026; Flagstaff, *Leiberg* 5780. NEW MEXICO: Navajo Indian Reservation, in Tunitcha Mountains, *Standley* 7841; Cedar Hill, San Juan County, *Standley* 7953; Fort Wingate, *Matthews* 1883; San Lorenzo, July 26, 1896, *Wooton*; Mogollon Mountains, *Rushby* 319; Farmington, San Juan County, *Standley* 7121; Bear Mountain, Grant County, *Metcalf* 695. MEXICO: Chihuahua, *Pringle* 780.

Section IV. KINGIA

Cordylanthus § *Hemistegia* (in part) Wats. Bot. King's Exped. 460. 1871; Gray, Syn. Fl. 2¹: 304.

Flowers in heads, calyx monophyllous; corolla as in *Euadenostegia*; stamens four, perfect.

15. ADENOSTEGIA KINGII (Wats.) Greene

Cordylanthus Kingii Wats. Bot. King's Exped. 233, 460. *pl.* 22, *f.* 3-6. 1871; Gray, Bot. Calif. 1: 581; Gray, Syn. Fl. 2¹: 304; Parry, Am. Nat. 9: 346; Coulter & Nelson, Man. Bot. Rocky Mts. 462.

Adenostegia Kingii Greene, Pittonia 2: 181. 1891; Kuntze, Rev. Gen. 2: 457; Wettstein in Engler & Prantl, Nat. Pflanzenfam. 4^{3b}: 98; Rydberg, Fl. Colo. 318.

Paniculately branching annual, 1–3 dm. high, glandular puberulent throughout, sometimes short-villous; leaves 20–30 mm. long, three-parted into linear divisions; heads few-flowered, the flowers spreading, giving an open appearance to the head; floral bracts 15–18 mm. long, three-nerved, irregularly dissected into five to seven linear divisions; calyx-leaf 22 mm. long, five-nerved, the teeth at the apex 1–2 mm. long; corolla 21–22 mm. long, the tube glabrous, somewhat longer than the throat, the latter covered with soft, reflexed hairs; filaments hairy; capsule pointed. [PLATE 10, FIG. 16.]

TYPE LOCALITY: "Rare; found only on a limestone ridge near Roberts Station in Monitor Valley, Nevada; 6,000 feet altitude; July."

DISTRIBUTION: White Pine County, Nevada; Emery, Garfield and Iron Counties, Utah.

SPECIMENS EXAMINED:—UTAH: two miles south of Ferron, *Jones 5454*; Sink Valley, June 20, 1890, *Jones*; Panguitch Lake, *Jones 6015*; head of Sevier River, *Jones 6032*; southern Utah, 1875, *Siler*.

16. *Adenostegia Helleri* sp. nov.

Paniculately branching annual, 2–4 dm. high; glandular-villous throughout with short, spreading hairs; leaves 6–15 mm. long, one-, sometimes three-, nerved; heads many, terminating the branchlets, one- to four-flowered; floral bracts 8–12 mm. long, five- to eight-parted; calyx-leaf lanceolate or shallowly two-toothed, four-nerved, winged at base; corolla 1–2 mm. longer than the calyx, throat soft-pubescent, equaling or slightly exceeding the tube; filaments nearly glabrous; capsule sharply pointed. [PLATE 10, FIG. 17; PLATE 12, FIG. 2.]

This species has been confused with *A. Kingii* but it differs in habit and in the bracts which in *A. Helleri* are smaller and regularly instead of irregularly divided.

TYPE LOCALITY: Hills north of Reno, Nevada, September 20, 1910, *Heller 10238*. TYPE, No. 2122 of the Dudley Herbarium.

DISTRIBUTION: Western Nevada, in the vicinity of Reno.

SPECIMENS EXAMINED:—NEVADA: Reno, *Brown 1564*; hills north of Reno, *Heller 10238*.

Section V. DICRANOSTEGIA

Cordylanthus § *Dicranostegia* Gray, Proc. Am. Acad. 19: 95. 1883; Gray, Syn. Fl. 2¹: 454.

Adenostegia § *Dicranostegia* Wettstein in Engler & Prantl, Nat. Pflanzenfam. 4^{3b}: 98. 1891.

Inflorescence spicate; calyx monophyllous; calyx-leaf deeply divided into two parts.

17. ADENOSTEGIA ORCUTTIANA (Gray) Greene

Cordylanthus Orcuttianus Gray, Proc. Am. Acad. 19: 95. 1883; Gray, Syn. Fl. 2¹: 454.

Adenostegia Orcuttiana Greene, Pittonia 2: 181. 1891; Kuntze, Rev. Gen. 2: 457; Wettstein in Engler & Prantl, Nat. Pflanzenfam. 4^{3b}: 98.

Divaricately branched, often decumbent, annual, 15–35 cm. high; stems stout, densely hirsute, sparsely so with age; leaves 25–30 mm. long, one-nerved, densely hirsute, sparsely so with age; leaves 25–30 mm. long, one-nerved, hispidulous, irregularly dissected into linear divisions; spike 2–6 cm. long; floral bracts 20–25 mm. long, setose-ciliate, three-nerved, tip broadly rounded; calyx-leaf 6 mm. long, thin, two-nerved, deeply or completely divided into acuminate divisions, the margins with soft pubescence interspersed with hirsute hairs; corolla about equalling the bracts, tube longer than the throat, curved outward, throat soft-pubescent; stamens four, the anthers small, one-celled with vestiges of a second cell, the upper anther sterile, the lower fertile, filaments glabrous. [PLATE 10, FIG. 18; PLATE 12, FIG. 3.]

TYPE LOCALITY: "Lower California, about 70 miles below the U. S. boundary, *H. C. Orcutt* and son."

DISTRIBUTION: Northwestern part of Lower California, from the international boundary to Ensenada.

SPECIMENS EXAMINED:—LOWER CALIFORNIA: Tia Juana, June 30, 1884, *Orcutt & Son*; same locality, July, 1896, *Stokes*; Mexican Boundary, *Mearns* 3927; Las Huevitas, 1893, *Brandeggee*; Ensenada, October 5, 1892, *Brandeggee*; San Pedro Martir, *Robinson* 45 (probably San Pedro Martir Island, not San Pedro Martir Mountains).

Section VI. CHLOROPYRON

Chloropyron Behr, Proc. Calif. Acad. I. 1: 61. 1855; Heller, Muhlenbergia 3: 133.

Cordylanthus § *Hemistegia* Gray, Proc. Am. Acad. 7: 383. 1868; Wats. Bot. King's Exped. 460 (in part); Gray, Syn. Fl. 2¹: 304.

Flowers in spikes; calyx monophyllous; corolla slightly sac-

cate, pink with purplish tip; stamens two or four, the upper, when present, imperfect, the lower with dilated filaments.

Key to species of § Chloropyron.

Stamens two.

- Bracts densely villous-hirsute..... 18. *A. mollis*.
 Bracts sparsely hirsute..... 19. *A. palmata*.

Stamens four.

- Herbage canescent, bracts lanceolate..... 20. *A. canescens*.
 Herbage glaucous, bracts generally three-toothed..... 21. *A. maritima*.

18. ADENOSTEGIA MOLLIS (Gray) Greene

Cordylanthus mollis Gray, Proc. Am. Acad. 7: 384. 1868; Wats. Bot. King's Exped. 460; Gray, Bot. Calif. 1: 582; Gray, Syn. Fl. 2¹: 304; Jepson, Fl. W. Mid. Calif. ed. 2. 287.

Adenostegia mollis Greene, Pittonia 2: 181. 1891; Kuntze, Rev. Gen. 2: 457; Wettstein in Engler & Prantl, Nat. Pflanzenfam. 4^{3b}: 98; Jepson, Fl. W. Mid. Calif. 417.

Chloropyron molle Heller, Muhlenbergia 3: 133. 1907.

Simple or divaricately branching annual, 3-4 dm. high with sparsely hirsute stems; leaves 5-7 mm. long, the lower entire, the upper incised, pubescence dense villous-hirsute; spike 3-10 cm. long, dense, and drooping; floral bracts 18-22 mm. long, villous-hirsute with long, spreading hairs, shallowly five- to eight-parted into finger-like divisions, the middle division exceeding the others, three-nerved; calyx-leaf 17-18 mm. long, four- or five-nerved, with two, sometimes three, erect teeth, completely hidden by the wide floral bract, lower part nearly glabrous, upper villous-hirsute; corolla 15-16 mm. long, the tube longer than the throat; stamens two, the upper pair lacking; capsule 7-9 mm. long, rounded; seeds 2-5 mm. long, deeply reticulate. [PLATE 10, FIG. 19.]

TYPE LOCALITY: "Mare Island, Bay of San Francisco, Charles Wright, in N. Pacif. Expl. Expedition, November, 1855."

DISTRIBUTION: A very local species, found only along the northern side of San Francisco Bay from Suisun to San Rafael.

SPECIMENS EXAMINED:—CALIFORNIA: Vallejo, July, 1883, Congdon; salt marshes near San Rafael and Petaluma, Davy 4063; Suisun Marshes near Suisun, Heller 7551; Suisun Marshes, 1892, Jepson; Mare Island, 1855, Wright (co-type).

19. *Adenostegia palmata* sp. nov.

Low annual, 1–2 dm. high, branching divaricately from the base, sparsely hirsute throughout with short hairs; leaves 8–18 mm. long, mostly incised, the lower sometimes entire; spike 5–10 cm. long, dense, erect; floral bracts 12–18 mm. long, deeply parted into five to eight finger-like divisions, the middle division exceeding the others, three- to five-nerved, often reddish; calyx-leaf 11–15 mm. long, entire or bidentate; corolla 12–16 mm. long, conspicuous, tube longer than throat; stamens two, the upper pair lacking. [PLATE 10, FIG. 20; PLATE 12, FIG. 4.]

TYPE LOCALITY: In alkaline soil, overflowed lands at Tule near College City, Colusa County, California, June 17, 1916, *Stinchfield* 284. TYPE, No. 70613 of the Dudley Herbarium.

This species differs most conspicuously from *A. mollis* in its sparse pubescence and its deeply parted, palmate bracts.

20. *ADENOSTEGIA MARITIMA* (Nutt.) Greene

Cordylanthus maritimus Nutt.; Bentham in De Candolle, Prodr.

10: 598. 1846; Gray, Proc. Am. Acad. 7: 383; Wats. Bot.

King's Exped. 460; Gray, Bot. Calif. 1: 581; Gray, Syn. Fl.

2¹: 304; Jepson, Fl. W. Mid. Calif. ed. 2. 387.

Chloropyron palustre Behr, Proc. Calif. Acad. 1: 61. 1855.

Adenostegia maritima Greene, Pittonia 2: 181. 1891; Kuntze, Rev.

Gen. 2: 457; Wettstein in Engler & Prantl, Nat. Pflanzenfam.

4^{3b}: 98; Jepson, Fl. W. Mid. Calif. 417; Abrams, Fl. Los

Angeles 372.

Chloropyron maritima Heller, Muhlenbergia 3: 133. 1907.

Decumbent annual, 2–3 dm. high, branching diffusely from the base or above, erect when young; stems puberulent, sometimes sparsely pubescent; floral bract 2–3 cm. long, pubescence varying from short-hairy to short-villous, 1-nerved, broadly lanceolate or shallowly three-toothed, the lateral teeth the smaller; calyx-leaf 12–15 mm. long, toothed at apex, the teeth scarcely 1 mm. long, covering as on bract; corolla 10–18 mm. long, covered with soft, short pubescence; stamens four, the upper pair with second cell imperfect or absent, the filaments glabrous; seeds 1–2 mm. long, deeply reticulate. [PLATE 10, FIG. 21.]

This variable species has two intergrading forms. Around San Francisco Bay and to the northward the plant is, in general, twice as large as the Southern California form. Both of these

forms, however, vary in the pubescence of the spike from nearly glabrous to short-villous in their respective localities. The floral bracts are either lanceolate or toothed, generally the latter. In its extreme variations the San Francisco Bay form approaches *A. mollis*. The species is very closely related to *A. canescens*, but the lanceolate bracts, the soft villous pubescence and the scantily hairy filaments of the latter furnish a basis for their separation.

TYPE LOCALITY: "Ad San Diego Californiae (Nuttall!)."

DISTRIBUTION: Salt marshes along the Pacific Coast from Humboldt Bay in California to San Quintan, Lower California.

SPECIMENS EXAMINED:—CALIFORNIA: Hookton, Humboldt Bay, Humboldt County, *Tracy* 3697; Samoa, Humboldt Bay, *Tracy* 1257; San Rafael, Marin County, *Bolander* 2403; Tiburon Peninsula, Marin County, *Heller* 5722; near San Francisco, *Vasey* 1875; Shell Mound, Oakland, Alameda County, July, 1880, *Rattan*; Belmont, San Mateo County, *Davy* 4063; Cooley's Landing, Palo Alto, September 14, 1901, *Dudley*; Ravenswood, Palo Alto, *Philips & Stinchfield* 269; Palo Alto, *Baker* 3557; same locality, 1901, *Congdon*; same locality, *Elmer* 3423; Alviso, Santa Clara County, July 18, *Dudley*; Milpitas, Santa Clara County, June, 1905, *Smith*; Playa del Rey, Los Angeles County, *Abrams* 1714; San Pedro, Los Angeles County, *Grant* 3124; Coronado Sand Spit, San Diego County, *Chandler* 4003; South San Diego, October 3, 1903, *Brandeggee*; mouth of the Tia Juana River, *Mearns* 3914; Mexican Boundary Monument 258, *Mearns* 3931. LOWER CALIFORNIA: San Quintan, May, 1899, *Brandeggee*.

21. ADENOSTEGIA CANESCENS (Gray) Greene

Cordylanthus canescens Gray, Proc. Am. Acad. 7: 383. 1868;

Wats. Bot. King's Exped. 233, 460; Gray, Bot. Calif. 1: 581;

Gray, Syn. Fl. 2¹: 304.

Cordylanthus Parryi Wats. in Parry, Am. Nat. 9: 346. 1875.

Cordylanthus canescens var. *Parryi* Gray, Syn. Fl. 2¹: 304. 1886.

Adenostegia canescens Greene, Pittonia 2: 181. 1891; Kuntze,

Rev. Gen. 2: 457; Rydberg, Bull. Torrey Club 40: 484.

Adenostegia Parryi Greene, Pittonia 2: 181. 1891.

Chloropyron canescens Heller, Muhlenbergia 3: 134. 1907.

Chloropyron Parryi Heller, Muhlenbergia 3: 134. 1907.

Divaricately and sometimes corymbosely branching annual, 2-4 dm. high, more or less canescent throughout with spreading, villous hairs; leaves 10-20 mm. long, lanceolate, prominently one-nerved, rarely three-nerved; spike erect, 2-4 cm. long; floral bracts 20-25 mm. long, more canescent than the leaves, lanceolate, often purplish at the tip; calyx-leaf 1-3 mm. shorter than the bract, two- or three-toothed at apex, the teeth erect or spreading with age; corolla tube equaling or slightly shorter than the throat; stamens four, the upper pair with second cell imperfect or absent, the filaments with scattered hairs, occasionally glabrous; capsule rounded; seeds reticulate. [PLATE 10, FIG. 22.]

Examination of a fragment and a photograph of the type of *Cordylanthus Parryi* shows that this is an immature specimen of *A. canescens*.

TYPE LOCALITY: "Near Carson City, Nevada, Dr. C. L. Anderson."

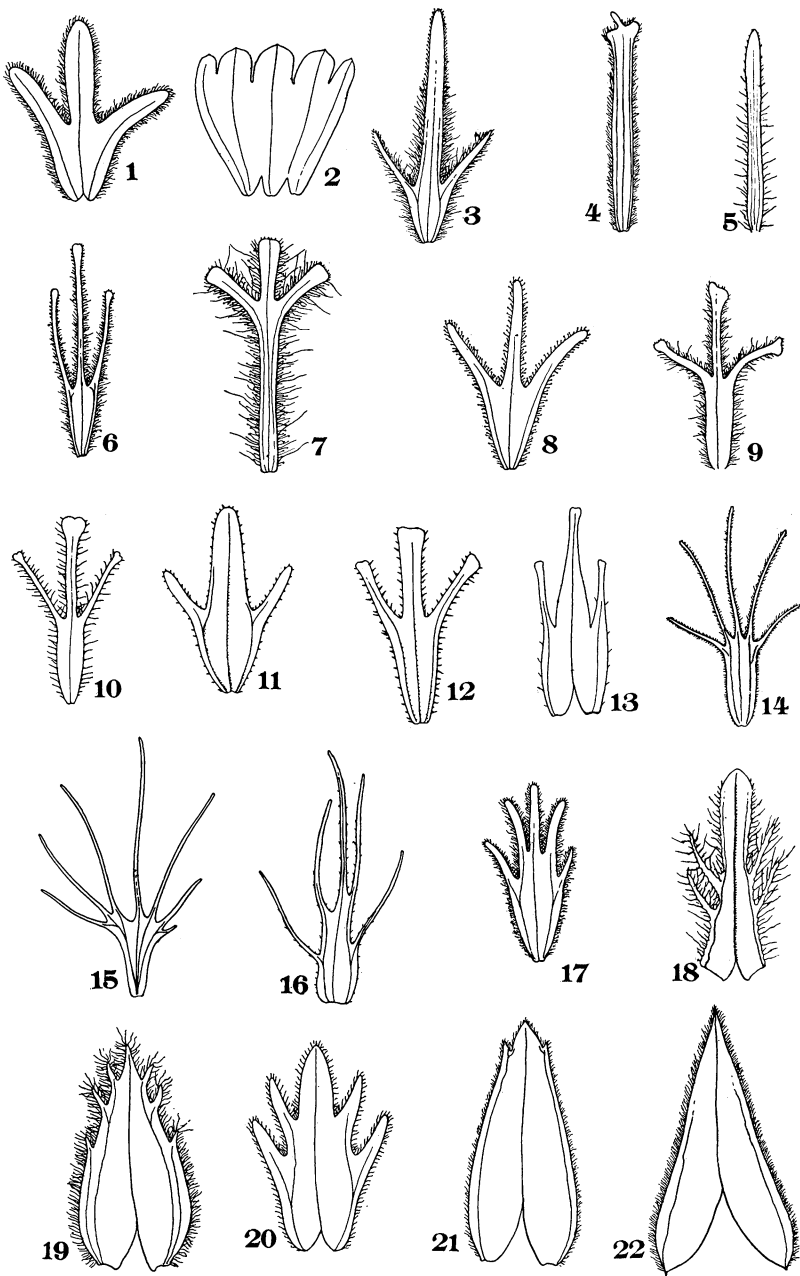
DISTRIBUTION: Saline lakes and springs in the Great Basin from eastern California and Oregon to Utah.

SPECIMENS EXAMINED:—OREGON: Goose Lake Valley, Lakeview, *Cusick 2767*; Denio, August, 1901, *Griffiths & Morris*. CALIFORNIA: Lake Lessons, Modoc County, *Mrs. Manning 328*; Honey Lake Valley, Lassen County, *Davy 3390*; Alkaline Meadows, San Bernardino County, 1888, *Parish*. NEVADA: Steamboat Springs, *Heller 10367*; same locality, *Kennedy 1488, 1499*; Eagle Valley, *Baker 1265*; Black Rock Desert, *Griffiths & Hunter 535*; Glendale, *Kennedy 1953*; near Carson City, *Anderson 201*. UTAH: Smelter Beach, Tooele County, 1891, *Smith*; Garfield Beach, Salt Lake, *Rydberg 6897*; Salt Lake City, *Jones 1403*; Ogden Hot Springs, August 16, 1893, *Ries*.

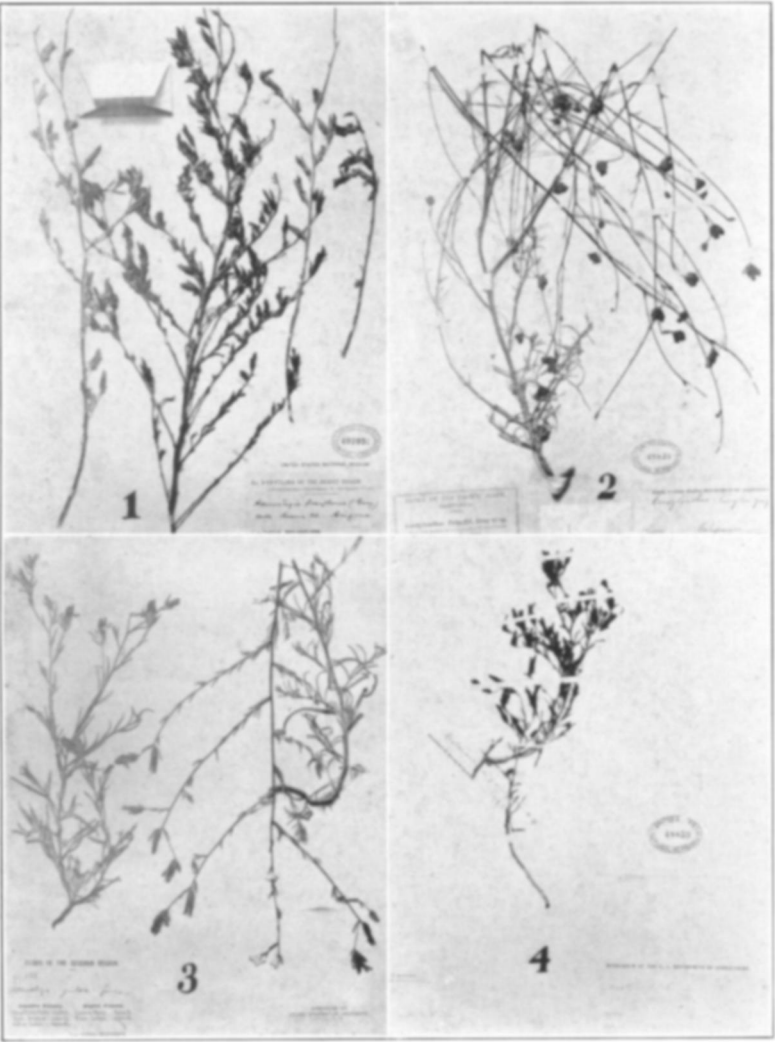
Explanation of plates 10-12

PLATE 10

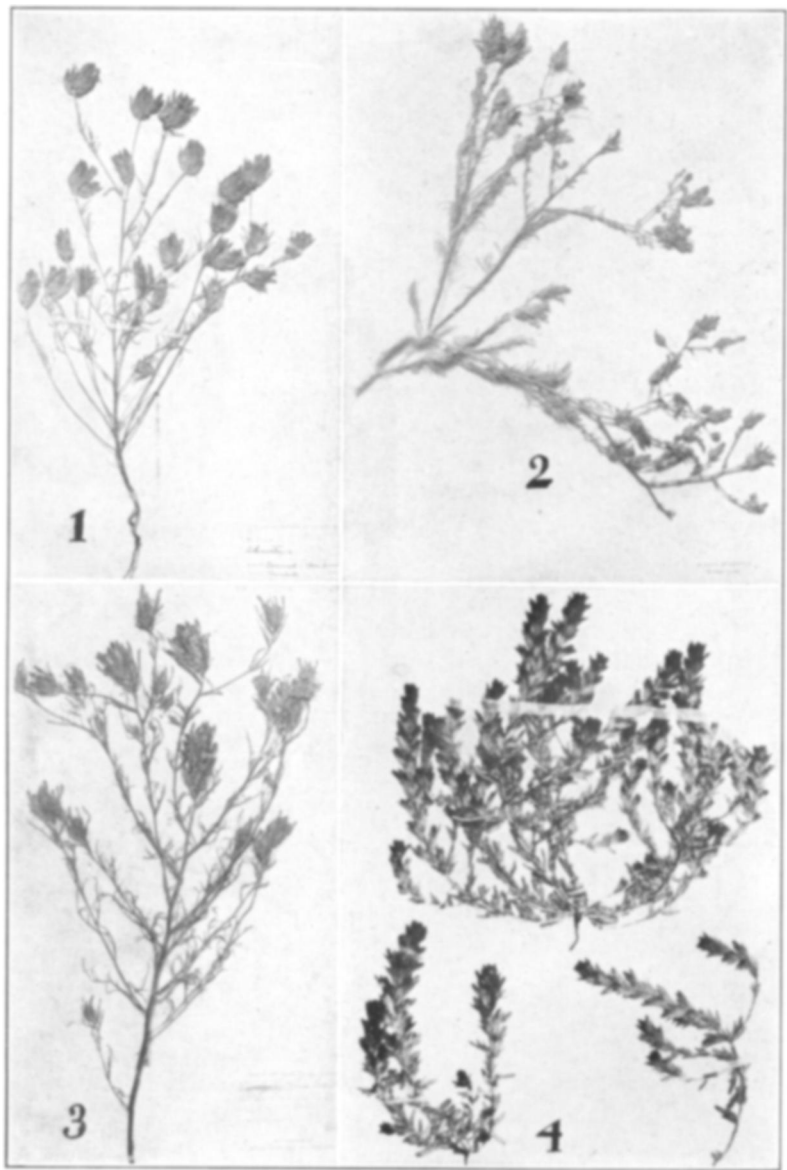
1. *Adenostegia laxiflora* (Gray) Greene; bract from specimen from Beaver Creek, Arizona, $\times 4$.
2. *Adenostegia Pringlei* (Gray) Greene; bract from specimen from near Bartlett Springs, California, $\times 2$.
3. *Adenostegia capitata* (Nutt.) Greene; bract from specimen from Gold Creek, Elko County, Nevada, $\times 1\frac{1}{2}$.
4. *Adenostegia pilosa* (Gray) Greene; bract from topotype specimen, $\times 1\frac{1}{2}$.
5. *Adenostegia tenuis* (Gray) Greene; bract from co-type specimen from near Lake Tahoe, Nevada, $\times 1\frac{1}{2}$.
6. *Adenostegia viscida* Howell; bract from specimen from Siskiyou Mountains, Oregon, $\times 2$.



FERRIS: ADENOSTEGIA



FERRIS: ADENOSTEGIA



FERRIS: ADENOSTEGIA

7. *Adenostegia Hanseni* Ferris; bract from the type, $\times 1\frac{1}{2}$.
8. *Adenostegia parviflora* Ferris; bract from the type, $\times 3\frac{1}{2}$.
9. *Adenostegia Nevinii* (Gray) Greene; bract from specimen from Bear Valley, San Bernardino County, California, $\times 4$.
10. *Adenostegia filifolia* (Nutt.) Abrams; bract from specimen from San Diego, California, $\times 1\frac{1}{2}$.
11. *Adenostegia rigida* Benth.; bract from specimen from the Santa Lucia Mountains, California, $\times 4\frac{1}{2}$.
12. *Adenostegia rigida brevibracteata* (Gray) Greene; bract from co-type specimen, $\times 3\frac{1}{2}$.
13. *Adenostegia littoralis* Ferris; bract from type, $\times 1\frac{1}{2}$.
14. *Adenostegia ramosa* (Nutt.) Greene; bract from specimen from Grizzly Butte, Crook County, Oregon, $\times 1\frac{1}{2}$.
15. *Adenostegia Wrightii* (Gray) Greene; bract from specimen from Chiracahua Mountains, Arizona, $\times 1\frac{1}{2}$.
16. *Adenostegia Kingii* (Wats.) Greene; bract from specimen from near Ferron, Utah, $\times 1\frac{1}{2}$.
17. *Adenostegia Helleri* Ferris; bract from type, $\times 1\frac{1}{2}$.
18. *Adenostegia Orcuttiana* (Gray) Greene; bract from specimen from Tia Juana, Lower California, $\times 1\frac{1}{2}$.
19. *Adenostegia mollis* (Gray) Greene; bract from specimen from Suisun Marshes, Solano County, California, $\times 1\frac{1}{2}$.
20. *Adenostegia palmata* Ferris; bract from type, $\times 1\frac{1}{2}$.
21. *Adenostegia maritima* (Nutt.) Greene; bract from specimen from Palo Alto, California, $\times 1\frac{1}{2}$.
22. *Adenostegia canescens* (Gray) Greene; bract from specimen from Smelter Beach, Tooele County, Utah, $\times 1\frac{1}{2}$.

PLATE II

1. *Adenostegia laxiflora* (Gray) Greene; Beaver Creek, Arizona.
2. *Adenostegia Pringlei* (Gray) Greene; co-type specimen from Lake County, California.
3. *Adenostegia Hanseni* Ferris; type.
4. *Adenostegia parviflora* Ferris; type.

PLATE I2

1. *Adenostegia littoralis* Ferris; type.
2. *Adenostegia Helleri* Ferris; type.
3. *Adenostegia Orcuttiana* (Gray) Greene; Tia Juana, Lower California, Stokes.
4. *Adenostegia palmata* Ferris; type.